CORRESPONDENCE

"Blueprint for Survival"

SIR,—In commenting on the *Blueprint for Survival*, you made heavy calls on your resources of invective, but few or none of your stocks of factual information. No reasonable person can deny that in the past few years there has been developed in the mass media a formula which might be called "the complacency of hysteria" — somebody prophesies imminent doom, and sets down his pen feeling he has done his good deed for the day. I suggest that, to the scientific public, a greater danger of misjudgment arises from what one might call a "hysteria of complacency". Is it good enough to dismiss, say, the population problem by the argument that it is not very pressing in Britain—so long as protein foodstuffs for man and beast are available at reasonable prices on the world market, which may well not be so for very long? Can one dismiss pollution, or exhaustion of easily won raw materials, because one could surmount these impediments by paying enough — if the economic system allowed?

I am far from urging that every statement of a Nobel Prize winner on any subject is necessarily the quintessence of wisdom, but when you accept for review a fat volume of a symposium on "The Place of Values in a World of Facts", organized by the Nobel Foundation two years ago, and attended by at least half a dozen winners of the Prize, should you not be tempted to think there could be something in the words of Tiselius in his opening speech: "[there is] a growing awareness among people of all nations that something is wrong with the world and that there is an urgent need to come together to see what should be done". Can we really leave the planet to a few technological fixes and the forces of the market? The *Blueprint for Survival* is, in my opinion, a carefully thought out treatment of the subject, not afraid to follow its arguments when they lead to far-reaching conclusions; but, of course, not always competely acceptable, either in detail or in time scale.

Yours faithfully,

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Arts and Sciences

SIR,—The precise causes of the recent decline[1,2] in the popularity of the sciences among school pupils who have just taken O level have been difficult to locate. At Marlborough the trend has just recently been reversed, but the results of a three year study into the factors affecting pupils' choices of A level courses have produced one or two unexpected and interesting features.

A questionnaire given to the 180 pupils who had just taken O level in the summer of 1966 established that the main influence affecting choice of A level course was interest in the subject[3]. There was little difference between the responses of the pupils who had (by then) chosen to follow arts courses, those of the pupils who had chosen to follow science courses, and those who had chosen to follow mixed arts–science courses, and the results tallied closely with those of other investigators[4–6], some working as long ago as 1935[7].

A number of observers[8,9] have suggested that the poor quality of the science teachers, or of the facilities and of the classrooms given to the science teaching, in schools has been responsible for the lack of interest shown in the courses offered. At Marlborough such facilities and teaching staff have remained fairly consistent during the period in question, and such a correlation seems altogether unlikely. Indeed, the 1966 questionnaire established quite clearly the relative unimportance of "quality of teaching" in choosing an A level programme. We decided, therefore, to look more deeply into the feelings about arts subjects and science subjects and, in order to do so, selected English as the most popular arts subject and physics as the most unpopular science subject. The procedure chosen for the investigation involved Osgood's semantic differential technique, and in this respect the work follows up some previous studies[11,12].

The O level pupils of the 1968 and 1969 population were asked to rate each of the twelve nouns listed in Table 1 on each of eleven pairs of adjectival opposites[11–13]. Factor analysis of the responses gave very similar results to those reported by previous investigators[10,14]. The use of the adjective pairs wise–foolish, sober–drunk, good–bad, successful–unsuccessful, correlated highly with each other, and the cluster was therefore used to derive an assessment of "evaluative goodness". Similarly, the adjective pairs hard–soft, masculine–feminine and active–passive formed a "potency" cluster, and hot–cold, active–passive, savoury–tasteless formed an "oriented activity" cluster. No other clusters were found to be statistically significant.

The adjective clusters were then used to derive three factor scores for each of the original twelve nouns, and the mean factor scores, multiplied by 100, are shown in Table 1.

Table 1 Mean Factor Scores (×100)

Evaluative goodness (wise positive)	A	S	Potency (masculine positive)	A	S	Oriented activity (hot positive)	A	S
Father	77	92	Games	69	71	Pleasure	89	92
Good schoolmaster	55	80	Work	36	20	Good schoolmaster	32	43
Home	39	41	Boy	29	46	Home	25	20
Success	29	47	Men *	26	43	Men	19	36
English *	11	−22	Success	24	14	Success	15	22
Pleasure	−07	05	Physics	22	13	Games	15	12
Work	−12	−16	Father	15	17	Father	14	19
Boy	−43	−32	Rules	13	−01	Boy	09	16
Games	−46	−31	Good schoolmaster	07	09	English †	−08	−46
Rules	−57	−64	English	−51	−62	Work	−51	−51
Men †	−60	−31	Home	−94	−79	Physics †	−100	−37
Physics †	−67	03	Pleasure	−103	−84	Rules	−110	−84

Significant differences between the A mean and the S mean are denoted by * (5%) and † (1%).

The columns headed by A show the scores returned by those pupils who had elected to follow a predominantly arts based course to A level, and those headed with an S show the scores returned by those pupils who had elected to follow a predominantly science based course to A level. The original intercorrelations between the adjectives were virtually the same for the A group as they were for the S group, and the factor scores were obtained using the pooled A and S intercorrelation.

The table shows that the A group and the S group agree fairly closely in their estimation of the twelve nouns, with the exception of "men", "English" and "physics". The S group awards "men" a less foolish, a more masculine and a hotter rating. The same group gives "physics" a less foolish, a very much more masculine and a less cold rating than "English" and identifies "physics" more closely with "men". The A group gives "English" a more wise and a less cold rating than "physics", but awards a feminine score to "English" and a masculine score to "physics". The implication seems to be that the A group prefers a somewhat feminine subject to study for A level, while the S group prefers a masculine one.

This feature can be highlighted by listing the difference between the mean factor scores given to "English" and "physics" by the two groups of pupils, subtracted in the order (chosen subject–rejected subject), on the three factor traits or dimensions. The results are shown in Table 2.

Table 2 Mean Factor Score Differences for (Chosen Subject–Rejected Subject)

	Wise–foolish dimension	Masculine–feminine dimension	Hot–cold dimension
A group	78†	−73†	92†
S group	25*	75†	09

Decimals and zeroes omitted.
* Significant at 5%, † significant at 1%.

The two main features of the table are very clear. The A group differentiates sharply between the chosen subject and the rejected one in each of the three dimensions, while the S group differentiates as sharply only along the masculine–feminine dimension. Further, the S group differentiation along this latter dimension is in exactly the opposite direction to that given by the A group.

Osgood and his co-authors have suggested that the distance between any two nouns in the three dimensional semantic space defined by the factor score axes is a measure of the difference of meaning between the two nouns[10]. The distances between "English" and "physics" and the other nouns included in the survey were evaluated by finding the root mean square differences between the three factor scores given to each noun, and the A pupils were found to place "English" close to "home" (d=0.61), "success" (d=0.81), "good schoolmaster" (d=0.83), and "father" (d=0.96), and relatively far away from "games" (d=1.35), "rules" (d=1.38) and "physics" (d=1.41). "Physics" was placed close to "rules" (d=0.17), "work" (d=0.75), and "boy" (d=1.12), and far from "father" (d=1.84), "home" (d=2.00) and "pleasure" (d=2.34). The S pupils placed "English" close to "physics" (d=0.79), "work" (d=0.82), "rules" (d=0.83) and "home" (d=0.93), and moderately far from "games" (d=1.46), "pleasure" (d=1.42), "good schoolmaster" (d=1.53) and "father" (d=1.53). "Physics" was placed close to "work" (d=0.24), "boy" (d=0.71), and "success" (d=0.74), and far from "good schoolmaster" (d=1.11), "home" (d=1.14) and "pleasure" (d=1.61).

It is clear that the S group pupils do not differentiate nearly as sharply as their A group counterparts between school subjects (except on the masculine–feminine factor of Table 2). The elements of the "home", "good", "schoolmaster" and "father" are missing from their chosen subjects, and they even opt for a course which they rate at a great distance from "pleasure". Conversely, the A group pupils select a course which contains a strong flavour of the feminine "home" and "pleasure" concept found by other workers in this field[13,14]. It could be pertinent to recall that, at the time these results were obtained, the adolescent trend towards unisex was strongly under way. The breaking down of the distinctions between the masculine and the feminine, and the desire to avoid being labelled as "arts" or "science" (more than 30 per cent of our population now study mixed arts and science courses to A level), seem in retrospect to have been concomitant phenomena.

Yours faithfully,

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UNISIST

SIR,—While the leading article "Slowly but Steadily with Information" (*Nature*, **234**, 268 ; 1971) is a fair summation of and comment on UNISIST, I feel that it does less than justice to the problems of exchanging information and current awareness and of copyright.

One of the most prevalent fallacies is that the average worker in basic research (whether in university, government, or industry) can keep up with the state-of-the-art by the means mentioned in the article. A few research workers can, those in relatively restricted field, those who are leaders in their field, and possibly some in the academic sphere. However, most research workers cannot, particularly those who are engaged in multidisciplinary research (for example, ecology) and those in government and industry.

Therefore, for the majority of people engaged in scientific research the most important part of the information exchange process is to, somehow, sort out from the great mass of published and quasi-published literature that which is relevant to their needs. All this must be done with the minimum of effort on the user's part, so that he is able to put the maximum effort into "reading and puzzling out what the other fellow means", which has been rightly identified as another important part of the information exchange process. This is, of course, why mechanized systems for retrospective and current awareness searching of the world's literature are so important and command so much attention at meetings like UNISIST.

To downgrade the importance of these systems, particularly on a worldwide basis, by assuming that they are not of primary importance to the research worker, is a significant error of judgment.

What appears to have been missed about copyright is that the development of new technology (for example, photocopying) has made the various copyright laws un-enforceable in any practical sense. Therefore, however sympathetic one may be to the concept of copyright and the views of the leader writer, it is essential to realize that the laws of copyright must be re-cast in the light not only of the present but of the future. Any other view is a denial of common-sense.

Yours faithfully,

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Population Control

SIR,—In your leader "The Duke and ZPG" (*Nature*, **234**, 499; 1971) you criticize the view that the British popula-